

### *Diaphragm*

A diaphragm is used to connect two girders together and to form a system that behaves as a single unit. The diaphragm also distributes the forces or loads throughout the girders. In addition, the girders are made continuous for live load by the use of a diaphragm, which provides benefits such as the ability to construct longer spans, improve durability and lower the bridge costs. Figure 47 presents a diagram of how the reinforcing steel is placed throughout the diaphragm. The reinforcing steel consists of several longitudinal bars running all the way through the diaphragm and stirrups that are extended into the deck slab.



**Figure 47. Diaphragm reinforcing steel (from [www.ncdot.org](http://www.ncdot.org))**

### *Experimental Test Set-Up*

The tests were performed in the North Carolina State University Constructed Facilities Laboratory (CFL). The connection was tested upside down as shown in Figure 48. The setup consisted of a steel frame to which a 220 kip (979 kN) actuator was connected. The actuator was used to apply the lateral load during the tests. The steel frame was rigidly attached to the laboratory strong floor using four 1-3/8 inch (34.9 mm) Dywidag bars and a bracing system was provided for stability. Five 60 ton (534 kN) jacks were used to apply axial loads to the column and bearing pads to simulate gravity effects. The axial load at the bearing pads was distributed by the use of two HSS beams at each bearing pad location (Figure 49). Figure 50 and Figure 51 show photographs of the test setup taken from various angles.